

# Rodent-borne Diseases Surveillance Report California 2000

GRAY DAVIS  
Governor  
State of California

Department of Health Services  
Division of Communicable Disease Control  
Disease Investigations and Surveillance Branch  
Vector-Borne Disease Section  
601 North 7<sup>th</sup> Street, MS 486  
P.O. Box 942732  
Sacramento, CA 94234-7320  
(916) 324-3738

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Grantland Johnson, Secretary  
California Health and Human Services Agency



Diana M. Bontá, R.N., Dr.P.H., Director  
Department of Health Services

**DEPARTMENT OF HEALTH SERVICES**  
**DISEASE INVESTIGATIONS AND SURVEILLANCE BRANCH**  
**VECTOR-BORNE DISEASE SECTION**  
601 N. 7th STREET, MS 486  
P.O. BOX 942732  
SACRAMENTO, CA 94234-7320  
(916) 324-3738  
(916) 445-5947 FAX



## Rodent-borne Diseases in California Annual Report 2000

### Hantavirus Pulmonary Syndrome

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Hantavirus pulmonary syndrome (HPS) was first recognized in 1993 when an outbreak of acute illness of unknown etiology occurred among residents of the Four Corners area in the southwestern United States. The illness was characterized by a prodrome of fever and flu-like symptoms that rapidly progressed to respiratory distress and was frequently fatal. The etiologic agent was identified as a previously unrecognized member of the hantavirus genus: Sin Nombre virus (SNV). Rodents, particularly deer mice (*Peromyscus maniculatus*), were identified as the reservoir of the virus, which they shed in urine and feces.

Since 1993, the California Department of Health Services (DHS), in cooperation with local health agencies, vector control programs, academic researchers, and others, has conducted surveillance for hantavirus in human and non-human mammals in California. This report summarizes results of this surveillance during 2000.

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### Hantavirus Pulmonary Syndrome in California Residents

**E**ight cases of HPS were identified in California residents during 2000. Investigations of these cases by DHS and collaborating agencies are summarized below.

Mono County, March 2000. A 40-year-old female resident of Mono County presented at a local emergency clinic with a three-day history of fever, headache, chills, and muscle aches. The patient was hospitalized with compromised respiratory function. Thoracic radiographs obtained at admission revealed some interstitial infiltrates. Following hospitalization, the patient's respiratory function continued to deteriorate; she was intubated and transferred to University of California, Davis, Medical Center for intensive care the next day. The patient died later that evening. Ante-mortem serum collected at the local emergency clinic and sent to TriCore Laboratories, University of New Mexico, was reported positive for immunoglobulin M (IgM) and immunoglobulin G (IgG) to SNV. Testing of post-mortem serum by the Centers for Disease Control and Prevention (CDC) and DHS' Viral and Rickettsial Diseases Laboratory (VRDL) detected IgM and low IgG to SNV. Lung and kidney tissues were positive for hantavirus by immunohistochemistry conducted at CDC.

Interviews with the patient's family revealed no known rodent exposure and no history of travel during the putative exposure period. The case-patient lived in a mobile home in southern Mono County, approximately 100 meters from a local motel where she was employed as custodial staff. Staff of DHS' Vector-Borne Disease Section (VBDS) and the Environmental Health departments of Mono and Inyo Counties conducted a site evaluation and rodent surveillance at the patient's residence, worksite, and surrounding areas. Inspection of the patient's residence revealed some evidence of rodent activity (droppings in cupboards and behind appliances) but no obvious infestation. Inspection of the motel and ancillary buildings revealed no evidence of rodent activity. Rodent trapping was attempted at the patient's residence, the motel and surrounding buildings, as well as in and around a nearby school. A total of 15 deer mice (*Peromyscus maniculatus*) were collected, of which five (33%) tested serologically positive for hantavirus. Information on rodent exclusion and control was provided to the patient's family, motel operator, and school administration.

Yolo County, April 2000. A 41-year-old male presented to a local hospital with four days of flu-like symptoms. At admission, the patient was noted to be febrile (105 °F) and thrombocytopenic (68,000/: L). The patient developed respiratory failure and died 24 hours after admission despite intubation and ventilatory support. Preliminary blood tests by a commercial laboratory suggested HPS; these results were subsequently confirmed by VRDL.

The patient worked for a local trucking company and regularly hauled hay from stations in Yolo, Sacramento, and Colusa Counties to facilities (e.g., feed stores, racetracks) in Santa Cruz, Los Angeles, Imperial, and San Diego Counties. Interviews with the patient's family did not indicate other travel or recreational activities that could have placed him at risk of exposure to rodents. Staff of VBDS, Yolo County Environmental Health, and other local agencies investigated sites that the patient visited in the weeks preceding his illness. Visual inspections of, and discussions with on-site personnel at, four delivery locations in southern California suggested that the patient would have had minimal to no opportunity for exposure to rodents as part of his job at these locations. Rodent surveillance was not performed at these sites. Site evaluations and rodent collection were conducted at pick-up and delivery facilities in northern California in Yolo (3 sites), Colusa, Sacramento, and Santa Cruz Counties. Trap success at all facilities was low (less than 10%) with house mice (*Mus musculus*) representing more than 50 percent of captures. Of 31 total deer mice (*P. maniculatus*) collected, only three of five from a pick-up site in Colusa County had serologic evidence of SNV infection. VBDS staff conducted a second round of rodent surveillance at the Colusa site in mid-June that yielded 11 deer mice; six of these, including four of four from an adjacent ranch, tested seropositive for SNV. In addition, one of three California voles (*Microtus californicus*) from the site was seropositive. However, these deer mice were collected from around rubbish piles and little-used buildings on the periphery of the facility, areas that the case-patient would not have visited as part of his normal job activities. Given the known itinerant history of the patient prior to onset of illness, as well as the inability to interview the patient regarding any other travels and activities during this period, the exact circumstances of exposure for this HPS case remain indeterminable.

Yolo County, May 2000. A 20-year-old male resident of Yolo County was hospitalized with "atypical pneumonia" following two days of fever, muscle ache, and cough. Although the patient developed respiratory compromise that required supplemental oxygen, he recovered completely and was discharged four days later. Serum collected at admission tested positive for IgM and IgG to SNV at a commercial laboratory; these results were subsequently confirmed at VRDL and CDC.

The patient reported having traveled to New Mexico in late March with a church group. The patient reported no other travel or activities that would pose a risk of rodent contact. While in New Mexico, the patient's church group worked on American Indian reservations where they performed maintenance and repair of buildings, including cleaning out reportedly rodent-infested sheds. All members of the group were provided masks to wear while working, but their actual use was reportedly infrequent. No other members of the group reported illness. This HPS case is noteworthy for the apparently protracted incubation period: approximately 46-51 days from exposure period to date of onset.

Ventura County, May 2000. A 27-year-old male resident of Ventura County was hospitalized with respiratory distress that required intubation and ventilatory support. Low grade fever (100.6 °F), thrombocytopenia (27,000/: L), and hemoconcentration (61%) were noted at admission. The patient survived. A commercial laboratory reported detecting IgM and IgG antibody to SNV; these results were subsequently confirmed by VRDL and CDC.

The patient lived in a multi-family residence in an urban part of the county. Evidence of *Rattus* sp. activity was evident in the garage; one night's trapping yielded no captures. He was employed as a groundskeeper for a commercial nursery since mid-April, but reported having seen no rodents on the property. Evidence of rodent activity was observed in some sheds where seed was stored. Rodent surveillance conducted by VBDS at the nursery and surrounding property yielded a total of 15 rodents, including five deer mice; all were seronegative for SNV. Because the patient was a poor historian and reticent to answer questions, it remains unclear what additional activities or travels may have contributed to his exposure.

Los Angeles County, June 2000. A 35-year-old male resident presented to a local hospital with a two-week history of gastrointestinal symptoms with shortness of breath for the last five days. Initial evaluation revealed fever, hemoconcentration, thrombocytopenia, and left-shift leukocytosis. Thoracic radiographs and CT scan revealed interstitial infiltrates and extensive pleural effusion. The patient responded to oxygen supplementation and did not require intubation or ventilatory support. He was discharged following ten days of hospitalization. VRDL, TriCore Laboratories, and CDC reported detecting IgG and IgM antibody to SNV in serum collected five days after admission.

The patient lived in the San Gabriel Valley and worked as a construction supervisor in southern California. Inspection of the patient's residence and worksite by the Los Angeles County Department of Health Services Vector Management Program identified minimal to no opportunity for contact with deer mice. The patient reported a fishing trip in early May to southern Mono County but denied seeing any evidence of rodents. Staff of VBDS and Mono County Environmental Health conducted evaluations and rodent surveillance at two facilities where the patient reported having stayed, one of which had reportedly been opened only recently prior to the case-patient's visit. While rodent harborage was prevalent around buildings, and significant populations of sciurid rodents were evident, no mice were trapped at either location.

Ventura County, August 2000. A 36-year-old male presented to a local hospital with a one-day history of fever. At admission, the patient was noted to have fever (103°F), thrombocytopenia (67,000/: L), and leukocytosis (32,900/: L). Thoracic radiographs revealed interstitial infiltrates; the patient was intubated and provided mechanical ventilation. He eventually recovered and was discharged. A serum specimen collected shortly after admission was submitted to a commercial laboratory which detected low IgG and strong IgM reactivity to SNV.

IgM antibody was detected in aliquots of this same specimen tested subsequently at VRDL, TriCore Laboratories, and CDC.

The patient resided in a developed area of Ventura County that provided minimal opportunity for contact with wild rodents. The patient reported camping in the eastern Sierra in early August, approximately one week prior to onset of illness. However, his activities consisted exclusively of hiking and sleeping outdoors, and he reported observing no mice. He brought his own food and camping equipment from home. Inspection of the storage facility in Ventura County where he kept the camping equipment revealed no evidence of rodents. No illness was reported in any other members of the camping party. The patient also reported visiting the Kaibab National Forest in northern Arizona in mid-July. Discussions with the staff of the United States Forest Service (USFS) indicated that while deer mice are present in the area, the lodgings at which the patient reported staying are well-maintained, regularly cleaned, and would pose little risk of exposure. Nevertheless, the lodge manager was notified of this case's possible association with the facility and USFS staff were reminded of the risk of hantavirus and the need to take appropriate precautions.

Los Angeles County, August 2000. A 52-year-old female resident was hospitalized with respiratory distress and thrombocytopenia following approximately four days of fever and fatigue. The patient's respiratory symptoms were relatively mild and she did not require intubation. Significant improvement was noted by day four of hospitalization and she was discharged on day ten. Serum was submitted to a commercial laboratory which reported detecting IgM and IgG antibody to SNV. Subsequent testing of this same specimen by VRDL and CDC confirmed the presence of SNV IgM antibody.

The patient lived in the hills of western Los Angeles County. Inspection of her home by biologists from DHS and the Los Angeles County Department of Health Services revealed considerable potential harborage for rodents (e.g., outbuildings, abandoned vehicles) but thorough examination revealed no obvious signs of actual rodent activity within or around the home. The patient reported traveling by motor home to southwestern Utah two-to-three weeks prior to onset. (Onset of illness occurred one week after arrival home from the trip.) The patient rented a houseboat at Lake Powell, Utah, for approximately one week. While traveling to and from Lake Powell she stayed in the motor home, stopping for the evening at roadside RV parks. She reported that the house boat was very clean, she did not observe any rodents, nor did she at any time during the trip enter any enclosed areas where rodents might have been present. Consultation by DHS with the Utah Department of Health indicated that while deer mice are prevalent in the Lake Powell area the houseboat concessionaires are well-informed about hantavirus and meticulous about cleanliness and rodent exclusion.

Sacramento County, September 2000. A 39-year-old female resident was hospitalized following five days of flu-like symptoms (fever, malaise, chills) and two days of cough and shortness of breath that progressed to adult respiratory distress syndrome (ARDS) and shock. Hematologic parameters at admission of thrombocytopenia (18,000/: L), leukopenia (600/: L), and slight hemoconcentration were suggestive of HPS. On the second day of hospitalization, the patient was transferred to a university hospital for extracorporeal membrane oxygenation (ECMO) therapy. The patient showed improved cardiopulmonary function and was removed from ECMO one week later. Serum specimens collected at admission and submitted to VRDL showed elevated IgM antibody to SNV. TriCore Laboratories confirmed both IgM and IgG seroreactivity to SNV.

The patient lived in a relatively new development in suburban Sacramento County. She reported seeing rodent droppings in an attic storage area and observed a single live mouse in the laundry room two days prior to onset. Upon inspection of the patient's residence by VBDS staff rodent droppings were identified in several areas, but were interpreted as most likely from house mice (*M. musculus*). No rodents were collected in or around the patient's residence over 180 trap-nights. Five *Microtus* sp. were collected from the surrounding neighborhood; sera from three (60%) of these tested positive for hantavirus antibody at VRDL. (These results most likely represent cross-reactivity to the hantavirus Isla Vista for which *Microtus* spp. are the principal reservoir.)

The patient reported camping in Yosemite National Park in late July. No other activities or travel were identified as possibly contributing to exposure. Staff of VBDS, the National Park Service, and Tuolumne County Department of Environmental Health conducted evaluation and rodent surveillance at the two sites in Yosemite National Park that the patient visited. Abundant evidence of rodent activity was observed at both sites. A total of 11 deer mice (*P. maniculatus*) were collected over 75 trap-nights at one site; of these, one (9%) was seropositive for SNV. At the other site, 89 deer mice were collected over 250 trap-nights, 21 (26%) of which were seropositive. Included were 13 seropositive deer mice from 32 (41%) collected in and around the ranger headquarters. DHS recommended that NPS implement measures to decrease rodents in and around areas of human activity and reduce the risk of SNV transmission to park visitors and staff.

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Since 1993, HPS has been diagnosed in 33 California residents (Tables 1 & 2). Four of these were identified retrospectively, with onset of illness having occurred in 1980, 1984, and 1992 (2). Twelve cases had a fatal outcome. An additional two California residents have been diagnosed with acute SNV infection without pulmonary syndrome. The mean age of all 35 case-patients was 40 years (range, 17 to 68) and 16 were female. Case-patients were residents of 16 counties--Alameda, Contra Costa (2), Inyo (5), Kern (4), Los Angeles (2), Modoc, Mono (8), Nevada (2), Plumas, Sacramento, Santa Barbara, San Bernardino, San Francisco, Santa Clara, Ventura (2), and Yolo (2). Probable and possible sites of exposure included the counties of Alameda, Fresno, Inyo (5), Kern (4), Modoc, Mono (10), Nevada (2), Placer, Plumas, Santa Barbara, and Tuolumne, and the states of Arizona, New Mexico (3), Utah, and Washington.

Nationwide, CDC reported a total of 34 HPS cases in 2000. Since 1993, 282 HPS cases have been confirmed in residents of 31 states; of these, 39 cases were identified retrospectively with onset of illness prior to May 1993. California, Arizona, New Mexico, and Colorado account for over 45 percent of all U.S. HPS cases. One hundred eighty-six (61%) case-patients were male; 218 (77%) were white, 55 American Indian, five African-American, and three Asian; 32 were of Hispanic ethnicity. The mean age of case-patients was 37 years (range, 10 to 75). One hundred-six (38%) HPS cases had a fatal outcome; the case-fatality in HPS cases occurring since 1993 is 30 percent.

## Hantavirus Surveillance in California Rodents

Surveillance for hantavirus in rodents was conducted in 22 California counties during 2000. A total of 1484 rodents were collected and serologically tested at VRDL, representing at least 22 species from 11 genera (Table 3). At least one seroreactive rodent was detected in 14 counties; in three of these counties—Colusa, Sacramento, Yuba-- rodents seroreactive to SNV were recorded for the first time in 2000. Of 1113 *Peromyscus* spp. collected, 68 (6.1%) had serologic evidence of infection with SNV. Seroprevalence was highest in *Peromyscus maniculatus* at 11.3 percent. Active surveillance since 1993 and retrospective analysis of rodent specimens captured since 1975 have identified serologic evidence of SNV infection in 537 (10.5%) of 5123 *P. maniculatus* tested. At least one seroreactive *P. maniculatus* specimen has been identified in 42 of 53 counties sampled (Table 4). *Reithrodontomys megalotis* and *Microtus californicus* specimens have demonstrated evidence of infection with Sin Nombre-like hantaviruses (El Moro Canyon and Isla Vista, respectively), but these strain variants have not been shown to be pathogenic to humans. Seroreactivity has been occasionally identified in *Neotoma*, *Chaetodipus*, and *Spermophilus* rodents in California and elsewhere; however, it is believed that these species are incidentally infected with SNV and are not competent reservoirs or vectors.

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## Arenaviruses

In August 2000, DHS reported the deaths of three California residents, between June 1999 and June 2000, due to an arenavirus not previously recognized as a human pathogen. All three case-patients were female and were hospitalized with a febrile illness that progressed to respiratory and hepatic failure. The case-patients were a 52-year-old from Riverside County, a 14-year-old from Alameda County, and a 30-year-old from Orange County. Based on analysis conducted at the University of Texas Medical Branch, diagnosis of arenavirus infection was made by isolation of virus or recovery of viral genetic material by polymerase chain reaction (PCR) from one or more tissues. Upon further evaluation, arenavirus was ruled out as the cause of the Orange County patient's illness. Although DHS and local agencies continue their investigations into these cases, the source and circumstances of exposure remain unknown.

The arenavirus associated with these cases was Whitewater Arroyo (WWA), an arenavirus previously observed only in rodents, principally *Neotoma* spp. WWA was first identified in *Neotoma albigula* from New Mexico in the early 1990s. Subsequently, surveillance conducted by local agencies has documented evidence of WWA activity among rodent populations in several southern California counties. To date, no evidence of WWA has been observed in rodents collected north of the Tehachapi range.

Following recognition of these cases, DHS initiated a statewide surveillance program for arenaviruses, including providing clinical consultation for suspect cases of illness, facilitating appropriate diagnostic testing, and collecting and testing of rodent for evidence of infection.

The Department of Health Services acknowledges the contribution of the following agencies to the California rodent-borne disease surveillance program in 2000:

Centers for Disease Control and Prevention, TriCore Laboratories, Alameda County Vector Control Service District, Colusa County Environmental Health, Colusa Mosquito Abatement District, Contra Costa Mosquito and Vector Control District, Kern County Environmental Health, Sutter-Yuba Mosquito and Vector Control District, Sacramento-Yolo Mosquito and Vector Control District, San Diego Vector Control Program, Riverside County Environmental Health, Santa Clara County Vector Control District, San Bernardino County Vector Control District, Inyo County Environmental Health, Los Angeles County Department of Health Services, San Mateo County Mosquito Abatement District, Orange County Vector Control District, Santa Barbara Coastal Vector Control District, Ventura County Health Department and Environmental Health, Yolo County Health Department and Environmental Health, Sacramento County Health Department, U.S. Army, Mono County Environmental Health and Health Department, United States Forest Service, National Park Service, Tuolumne County Environmental Health, University of Texas Medical Branch-Galveston

Report compiled by Curtis L. Fritz, D.V.M., Ph.D.



**Table 1. California Hantavirus Pulmonary Syndrome cases, 2000**

<b>Case No.</b>	<b>Onset date</b>	<b>County of residence</b>	<b>Age</b>	<b>Sex</b>	<b>Outcome</b>	<b>Likely exposure locale</b>	<b>Exposure circumstances</b>
26	March 2000	Mono	42	F	Died	Lee Vining, Mono	Peridomestic
27	May 2000	Yolo	41	M	Died	unknown	unknown
28	May 2000	Yolo	20	M	Surv	New Mexico	Occupational
29	May 2000	Ventura	27	M	Surv	unknown	unknown
30	June 2000	Los Angeles	35	M	Surv	Mono Co.	Recreational
31	August 2000	Ventura	36	M	Surv	Mono Co. or Arizona	Recreational
32	August 2000	Los Angeles	52	F	Surv	Utah	Recreational
33	September 2000	Sacramento	39	F	Surv	Tuolumne Co.	Recreational

Source: California Department of Health Services

**Table 2. California Hantavirus Pulmonary Syndrome cases, 1980-1999**

Case No.	Onset date	County of residence	Age	Sex	Outcome	Likely exposure locale	Exposure circumstances
1	February 1980	San Francisco	22	M	Died	New Mexico	Peridomestic
2	February 1984	Inyo	34	F	Died	Deep Springs, Inyo	Peridomestic
3	September 1992	Santa Barbara	29	M	Died	Solvang, Santa Barbara	Occupational
4	August 1992	Alameda	49	F	Died	WA State or Mono County	Recreational
5	July 1993	Mono	27	F	Died	Mammoth Lakes, Mono	Peridomestic
6	March 1994	San Bernardino	42	F	Surv	New Mexico	Peridomestic
7	May 1994	Kern	42	M	Died	Mojave, Kern	Occupational
8	September 1994	Mono	56	M	Surv	Lee Vining, Mono	Occupational
9	February 1995	Mono	42	F	Surv	Walker, Mono	Peridomestic
10	March 1995	Nevada	47	M	Surv	Truckee, Nevada	Occupational
11	June 1995	Mono	45	M	Died	Crowley Lake, Mono	Peridomestic
12	August 1995	Contra Costa	55	M	Died	Cisco Grove, Placer	Recreational
13	September 1995	Plumas	32	F	Surv	Graeagle, Plumas	Peridomestic
14	July 1996	Modoc	49	M	Surv	Alturas, Modoc	Peridomestic
15	July 1997	Nevada	43	M	Surv	Truckee, Nevada	Recreational
16	October 1997	Inyo	38	M	Surv	Bishop, Inyo	Occupational
non-P 1	July 1998	Mono	37	F	Surv	Mono	Peridomestic
17	August 1998	Mono	55	F	Surv	Mono	Occupational
18	August 1998	Santa Clara	19	F	Surv	Hume Lake, Fresno	Occupational
19	November 1998	Kern	68	M	Died	Inyokern, Kern	Peridomestic
20	March 1999	Kern	33	M	Surv	Taft, Kern	Occupational
21	April 1999	Kern	23	M	Died	Shafter, Kern	Peridomestic
22	June 1999	Inyo	17	F	Died	Bishop, Inyo	Peridomestic
23	June 1999	Inyo	66	F	Surv	Olancho, Inyo	unknown
24	July 1999	Mono	47	F	Surv	Swall Meadows, Mono	Peridomestic
non-P 2	September 1999	Inyo	50	M	Surv	Independence, Inyo	Recreational?
25	April 1999	Contra Costa	27	F	Died	Contra Costa or Alameda	unknown

Non-P #

= Acute Sin Nombre virus infection without pulmonary syndrome

**Table 3. Serologic evidence of hantavirus in rodents collected in California, 1975-2000**

Species	Common name	2000		1975-2000	
		No. collected	No. reactive	No. collected	No. reactive
FAMILY SIGMODONTIDAE(New World mice and rats)					
<i>Neotoma fuscipes</i>	dusky-footed woodrat	71	0	600	4 (0.7%)
<i>Neotoma lepida</i>	desert woodrat	52	2 (3.8%)	279	6 (2.2%)
<i>Neotoma</i> sp.	other and non-speciated <i>Neotoma</i>	10	0	60	2 (3.3%)
<i>Onychomys torridus</i>	southern grasshopper mouse	0		1	0
<i>Peromyscus boylii</i>	brush mouse	210	10 (4.8%)	715	20 (2.8%)
<i>Peromyscus californicus</i>	parasitic mouse	306	4 (1.3%)	945	23 (2.4%)
<i>Peromyscus crinitus</i>	canyon mouse	30	1 (3.3%)	95	4 (4.2%)
<i>Peromyscus eremicus</i>	cactus mouse	75	0	396	7 (1.8%)
<i>Peromyscus maniculatus</i>	deer mouse	462	52 (11.3%)	5123	537 (10.5%)
<i>Peromyscus truei</i>	piñon mouse	26	1 (3.8%)	544	19 (3.5%)
<i>Peromyscus</i> sp.	other and non-speciated <i>Peromyscus</i>	4	0	104	12 (11.5%)
<i>Reithrodontomys megalotis</i> <sup>1</sup>	western harvest mouse	64	8 (12.5%)	387	49 (12.7%)
<i>Sigmodon hispidus</i>	hispid cotton rat	8	0	22	0
FAMILY ARVICOLIDAE(voles)					
<i>Clethrionomys californicus</i>	California red-backed vole	0		1	0
<i>Microtus californicus</i> <sup>2</sup>	California vole	14	5 (35.7%)	133	25 (18.8%)
<i>Microtus</i> spp. <sup>2</sup>	other and non-speciated <i>Microtus</i>	12	3 (25.0%)	24	4 (16.7%)
FAMILY HETEROMYIDAE					
<i>Chaetodipus</i> spp.	pocket mice	65	1 (1.5%)	203	2 (1.0%)
<i>Dipodomys</i> spp.	kangaroo rat	1	0	68	1 (1.5%)
<i>Perognathus parvus</i>	Great Basin pocket mouse	3	0	26	1 (3.8%)
FAMILY SCIURIDAE(squirrels and chipmunks)					
<i>Ammospermophilus leucurus</i>	white-tailed antelope squirrel	1	0	5	0
<i>Glaucomys sabrinus</i>	northern flying squirrel	0		1	0
<i>Sciurus griseus</i>	western gray squirrel	0		1	0
<i>Spermophilus</i> spp.	ground squirrels	0		1226	1 (0.1%)
<i>Tamias</i> spp.	chipmunks	0		284	0
<i>Tamiasciurus douglasii</i>	Douglas’ squirrel	0		8	0
FAMILY MURIDAE(Old World mice and rats)					
<i>Mus musculus</i>	house mouse	60	0	230	0
<i>Rattus</i> spp.	Norway rat & black rat	10	0	157	0

<sup>1</sup> El Moro Canyon virus<sup>2</sup> Isla Vista virus

**Table 4. Serologic evidence of hantavirus in *Peromyscus maniculatus* in California, 1975-2000\***

County	2000			1975-2000		
	No. collected	No. reactive	%	No. collected	No. reactive	%
Alameda	3	0		47	2	4.3
Alpine				55	11	20.0
Butte				115	14	12.2
Calaveras				45	9	20.0
Colusa	23	9	39.1	23	9	39.1
Contra Costa				36	0	
Del Norte				49	1	2.0
El Dorado				41	6	14.6
Fresno				462	59	12.8
Glenn				4	0	
Humboldt				55	5	9.1
Imperial				6	1	16.7
Inyo				75	5	6.7
Kern	10	1	10.0	129	10	7.8
Lake				22	1	4.5
Lassen	15	2	13.3	41	5	12.2
Los Angeles	10	0		334	16	4.8
Madera				62	8	12.9
Marin				105	3	2.9
Mendocino				16	0	
Merced				68	4	5.9
Modoc				65	10	15.4
Mono	15	5	33.3	227	47	20.7
Monterey	52	4	7.7	106	9	8.5
Mariposa				46	7	15.2
Napa				24	0	
Nevada	11	0		150	52	34.7
Orange				204	10	4.9
Placer	3	0		32	2	6.2
Plumas				67	14	20.9
Riverside	37	0		490	22	4.5
Sacramento				36	0	
San Bernardino	31	2	6.5	245	8	3.3
San Diego	70	5		289	15	5.2
San Francisco				30	0	
San Joaquin				11	1	9.1
San Luis Obispo				65	5	7.7
San Mateo	15	2	13.3	113	6	5.3
Santa Barbara	1	0		301	86	28.6
Santa Clara	7	0		32	0	
Shasta				32	4	12.5
Sierra				46	9	19.6
Siskiyou				117	12	10.3
Solano				3	0	
Sonoma				133	1	0.8
Stanislaus				15	0	
Tehama				35	5	14.3
Trinity				24	8	33.3
Tulare				20	2	10.0
Tuolumne	100	22	22.0	130	23	17.7
Ventura	5	0		190	10	5.3
Yolo	23	0		24	0	
Yuba	31	0		31	0	
<b>Total</b>	<b>462</b>	<b>52</b>	<b>11.3</b>	<b>5123</b>	<b>537</b>	<b>10.5</b>

\* These data represent records currently entered in the DHS statewide rodent hantavirus database and are not necessarily comprehensive of results of all hantavirus surveillance conducted by local departments, academic researchers, and other agencies that conduct regional surveillance independent of DHS. Counties for which DHS has yet to document results of rodent hantavirus surveillance are not listed.